

Calc Weekly Review 7 0910

- 1) Evaluate each of the following limits algebraically and discuss the continuity of the function including any points of discontinuity.

a) $\lim_{x \rightarrow 1^+} \begin{cases} x^2 - 2, & x < 1 \\ -\frac{1}{2}x + 1, & x \geq 1 \end{cases}$

b) $\lim_{x \rightarrow \infty} \frac{6x+1}{|6-2x|}$

c) $\lim_{x \rightarrow 5} \frac{5-6x+x^2}{5-x}$

d) $\lim_{x \rightarrow 3} 5 - 2x + x^2$

- 2) Write the equation of the tangent line to the function at the given value of x , if it exists.

a) $f(x) = x \csc(x)$ at $x = \frac{\pi}{6}$

b) $f(x) = \begin{cases} x^2 - 2, & x < 1 \\ \frac{1}{2}x - \frac{5}{2}, & x \geq 1 \end{cases}$ at $x = 1$

- 3) Find $\frac{dy}{dx}$ for each equation below.

a) $xy = \sin(x) + y^2$

b) $y = \sin(x^3 - 5x + 1)$

c) $y = (x^3 - 1)\cos(x)$

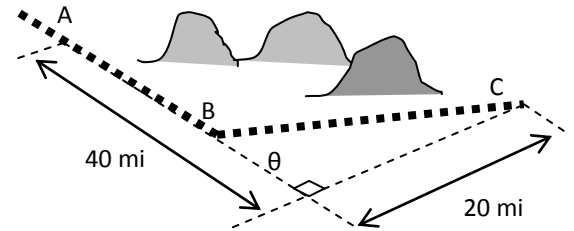
d) $y = \frac{2x+5}{3x-1}$

4) Let $f'(x) = 4x^3 - 8x^2$.

- Identify where the extrema of $f(x)$ occur.
- Find the intervals on which $f(x)$ is increasing and the intervals on which $f(x)$ is decreasing.
- Find where the graph of $f(x)$ is concave up and where it is concave down.
- Sketch a possible graph of $f(x)$.

- 5) Shown in the figure is a proposed railroad route through three towns located at points A, B, and C. The track will branch out from B toward C at an angle θ .

- Show that the total distance d from A to C is given by $d(\theta) = 40 + 20 \tan \frac{1}{2} \theta$.
- Because of the mountains between A and C, the branching point B must be at least 20 miles from A. Is there a route that avoids the mountains and measures exactly 50 miles? If so, find it. If not, show why.
- Where would you place B and what angle of θ would you use to minimize the distance from A to C while still avoiding the mountains?



Answers to Calc Weekly Review 7 0910

1)

- a) limit is
- b) limit is
- c) limit is
- d) limit is

2)

- a)
- b)

3)

- a) $\frac{dy}{dx} =$
- b) $\frac{dy}{dx} =$
- c) $\frac{dy}{dx} =$
- d) $\frac{dy}{dx} =$

4)

- a)
- b)
- c)
- d)

5)

- a) The first four I just didn't have time to do, but this one, well this one is just too dang hard!
- b)
- c)